Enclosure Types

The purpose of this document is to provide general information on the definitions of NEMA enclosure types to architects, engineers, installers, inspectors, and other interested parties. [For more detailed and complete information, consult NEMA Standards Publication 250-1997, "*Enclosures for Electrical Equipment (1000 Volts Maximum).*"

Definitions

(from NEMA 250-1997)

In Nonhazardous Locations, the specific enclosure types, their applications, and the environmental conditions they are designed to protect against, **when completely and properly installed**, are as follows:

Type 1 - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide a degree of protection against falling dirt.

Type 2 - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment, to provide a degree of protection against falling dirt, and to provide a degree of protection against dripping and light splashing of liquids.

Type 3 - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, and windblown dust; and that will be undamaged by the external formation of ice on the enclosure.

Type 3R - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, and snow; and that will be undamaged by the external formation of ice on the enclosure.

Type 3S - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, and windblown dust; and in which the external mechanism(s) remain operable when ice laden.

Type 4 - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust,

splashing water, and hose-directed water; and that will be undamaged by the external formation of ice on the enclosure.

Type 4X - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water, and corrosion; and that will be undamaged by the external formation of ice on the enclosure.

Type 5 - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against settling airborne dust, lint, fibers, and flyings; and to provide a degree of protection against dripping and light splashing of liquids.

Type 6 - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during occasional temporary submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure.

Type 6P - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during prolonged submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure.

Type 12 - Enclosures constructed (without knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers, and flyings; and against dripping and light splashing of liquids.

Type 12K - Enclosures constructed (with knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers, and flyings; and against dripping and light splashing of liquids.

Type 13 - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers, and flyings; and against the spraying, splashing, and seepage of water, oil, and noncorrosive coolants.

Table 2-1. Comparison of Specific Applications of Enclosures for Indoor Nonhazardous Locations *(from NEMA 250-1997)*

	Type of Enclosure									
Provides a Degree of Protection Against the Following Environmental Conditions	**1 ***	**2 ***	**4**	**4X**	**5**	**6**	**6P**	**12**	**12K**	**13**
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Falling dirt	X	X	X	X	X	X	X	X	X	X
Falling liquids and light splashing	...	X	X	X	X	X	X	X	X	X
Circulating dust, lint, fibers, and flyings **	...	...	X	X	...	X	X	X	X	X
Settling airborne dust, lint, fibers, and flyings **	...	...	X	X	X	X	X	X	X	X
Hosedown and splashing water	...	...	X	X	...	X	X	...	...	...
Oil and coolant seepage	...	...	...	..	...	...	...	X	X	X
Oil or coolant spraying and splashing	...	...	...	...	...	...	...	...	...	X
Corrosive agents	...	...	...	X	...	...	X	...	...	...
Occasional temporary submersion	...	...	...	...	...	X	X	...	...	...
Occasional prolonged submersion	...	...	...	...	...	...	X	...	...	...

* These enclosures may be ventilated.

** These fibers and flyings are nonhazardous materials and are not considered Class III type ignitable fibers or combustible flyings. For Class III type ignitable fibers or combustible flyings see the National Electrical Code, Article 500.

Table 2-2. Comparison of Specific Applications of Enclosures for Outdoor Nonhazardous Locations *(from NEMA 250-1997)*

	Type of Enclosure						
Provides a Degree of Protection Against the Following Environmental Conditions	**3**	**3R***	**3S**	**4**	**4X**	**6**	**6P**
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X
Rain, snow, and sleet **	X	X	X	X	X	X	X
Sleet ***	...	...	X	...	...	...	...
Windblown dust, lint, fibers, and flyings	X	...	X	X	X	X	X
Hosedown	...	...	...	X	X	X	X
Corrosive agents	...	...	...	...	X	...	X
Occasional temporary submersion	...	...	...	...	...	X	X
Occasional prolonged submersion	...	...	...	...	...	...	X

* These enclosures may be ventilated.

** External operating mechanisms are not required to be operable when the enclosure is ice covered.

*** External operating mechanisms are operable when the enclosure is ice covered.

In Hazardous Locations**, when completely and properly installed and maintained**, type 7 and 10 enclosures are designed to contain an internal explosion without causing an external hazard. Type 8 enclosures are designed to prevent combustion through the use of oil-immersed equipment. Type 9 enclosures are designed to prevent the ignition of combustible dust.

Type 7 - Enclosures constructed for indoor use in hazardous locations classified as Class I, Division 1, Groups A, B, C, or D, as defined in NFPA 70.

Type 8 - Enclosures constructed for either indoor or outdoor use in hazardous locations classified as Class I, Division 1, Groups A, B, C, and D, as defined in NFPA 70.

Type 9 - Enclosures constructed for indoor use in hazardous locations classified as Class II, Division 1, Groups E, F, or G, as defined in NFPA 70.

Type 10 - Enclosures constructed to meet the requirements of the Mine Safety and Health Administration, 30 CFR, Part 18.

Table SA-1. Comparison of Specific Applications of Enclosures for Indoor Hazardous Locations *[From NEMA 250-1997]*

(If the installation is outdoors and/or additional protection is required by Table 2-1 and Table 2-2, a combination-type enclosure is required)

Provides a Degree of Protection Against Atmospheres Typically Containing		**Enclosure Types 7 and 8, Class I Groups ****				**Enclosure Type 9 Class II Groups**			
(See NFPA 497M for Complete Listing)	**Class**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**10H**
Acetylene	I	X	...	...	...				
Hydrogen, manufactured gas	I	...	X	...	...				
Diethyl ether, ethylene, cyclopropane	I	...	...	X	...				
Gasoline, hexane, butane, naphtha, propane, acetone, toluene, isoprene	I	...	...	...	X				
Metal dust	II	...	...	...	...	X			
Carbon black, coal dust, coke dust	II	...	...	...	...		X		
Flour, starch, grain dust	II	...	...	...	...			X	
Fibers, flyings *	III	...	...	...	...			X	
Methane with or without coal dust	MSHA	...	...	...	...				X

Comparison Between NEMA Enclosure Type Numbers and IEC Enclosure Classification Designations

IEC Publication 60529, Classification of Degrees of Protection Provided by Enclosures, provides a system for specifying the enclosures of electrical equipment on the basis of the degree of protection provided by the enclosure. IEC 60529 does not specify degrees of protection against mechanical damage of equipment, risk of explosions, or conditions such as moisture (produced, for example, by condensation), corrosive vapors, fungus, or vermin. The NEMA Standard for Enclosures for Electrical Equipment does test for environmental conditions such as corrosion, rust, icing, oil, and coolants. For this reason, and because the test and evaluations for other characteristics are not identical, the IEC enclosure classification designations cannot be exactly equated with the enclosure type numbers in this standard.

The IEC designation consists of the letters IP followed by two numerals. The first characteristic numeral indicates the degree of protection provided by the enclosure with respect to persons and solid foreign objects entering the enclosure. The second characteristic numeral indicates the degree of protection provided by the enclosure with respect to the harmful ingress of water.

Table A-1 provides an equivalent conversion from the enclosure type numbers in this standard to the IEC enclosure classification designations. The enclosure type numbers meet or exceed the test requirements for the associated IEC Classification; for this reason, Table A-1 cannot be used to convert from IEC classifications to enclosure type numbers.

Table A-1. Conversion of Enclosure Type numbers to IEC Classification Designations (*From NEMA 250-1997)*
Cannot be used to convert IEC Classification Designations to NEMA Type numbers

Enclosure Type Number	IEC Enclosure Classification Designation
1	IP10
2	IP11
3	IP54
3R	IP14
3S	IP54
4 and 4X	IP56
5	IP52
6 AND 6P	IP67
12 AND 12K	IP52
13	IP54

This comparison is based on tests specified in IEC Publication 60529.